Loss and Reversion of Sevin Resistance in Musca domestica nebulo Fabr

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CITATION:

ANSARI, Musharraf A.. Loss and Reversion of Sevin Resistance in Musca domestica nebulo Fabr. 防虫科学 1972, 37(4): 123-125

ISSUE DATE:

1972-11-30

URL:

http://hdl.handle.net/2433/158737

原　著

Loss and Reversion of Sevin Resistance in *Musca domestica nebulo* Fabr. Musharraf A. Ansari (Department of Zoology, Aligarh Muslim University, Aligarh, India.) Received August 1, 1972. *Botyu-Kagaku*, 37, 123, 1972.

17. イエバエにおけるセビン抵抗性の消失と再現 Musharraf A. Ansari (Aligarh Muslim 大学動物学教室) 47. 8. 1 受理

淘汰法で先に得たセビン抵抗性イエバエについて，抵抗性の消失と再現の実験を行なった．イエバエを3つのコロニーにわけ，1つは，ひきつづき10代淘汰をつづけた．第2のコロニーはセビンなしの状態で飼育した．第3のコロニーは，隔代で淘汰した．第1のコロニーは，抵抗性を増し，第2のコロニーは減少した．第3のコロニーは抵抗性の減少はみられなかった．

That an insecticide resistant strain of housefly, *M. domestica* reverted to susceptibility when bred under insecticide free environment have been shown by several workers. King (1950) observed a definite decline of DDT resistance in Orlands strain of *M. domestica* when reared without DDT pressure for 14 generations. The NAIDM strain which had developed a strong BHC resistance was reverted to susceptibility in 20 generations without selection pressure (Pimentel *et al.*, 1953). A strain of *M. domestica nebulo* when reared in absence of insecticide totally lost its aldrin and BHC resistance in only 10 to 11 generations respectively (Abedi, 1958). Similar results were also observed by Khan and Ansari (1964) in a DDT resistant strain of *M. d. nebulo*.

Contrary to the above findings, three DDT resistant strains developed in the laboratory did not lose any degree of resistance in even 30 generations without selection pressure (Bruce and Decker, 1950). D'Alessandre and Mariani (1953) were failed to detect any loss of DDT resistance in a strain isolated from a multiresistant Patrinico Colony. Georghiou (1965) also reported that there was no decrease in a isopropoxyphenyl *N*-methyl carbamate resistance in a strain of *Culex fatigans* when bred for 10 generations without any exposure to the insecticide.

The above findings clearly indicate that any population of insects after having reached to homogenity to a particular insecticide maintains its resistance even in environment free of insecticide. On the other hand if the population consists some homozygous susceptible individuals or hybrid, relexation of pressure may lowered the level of resistance. The rate of loss chiefly depends on the number of hybrids in the population and their susceptibility to the selecting chemical.

The present work was under taken to find out if the sevin resistant strain of *M. d. nebulo* maintains its resistance when reared without insecticidal pressure in the laboratory.

Materials and Methods

Flies were collected from the field and brought to the laboratory. In F_1 generation the flies belonging to form *nebulo* were separated and bred to produce the next generation. When four day old, they were tested topically with the desired concentrations of sevin solutions in ethanol after the manner described by Busvine (1951). The survivals thus obtained were reared at a temperature of 28 ±1°C and 60 to 70% relative humidity on cotton pads soaked in diluted milk. In this way selection was continued upto 22 generations when the loss and reversion of resistance was studied by dividing the flies into three subcolonies. Of these one was continued to be selected with sevin in subsequent generations while other was bred in an environment free of insecticide and the third one was selected in alternate generations of rearing.

Results

It is clear from the (Table 1 and Fig. 1) that continuous selection of the first subcolony A for ten generations resulted 1.6 fold increase in LC_{50}

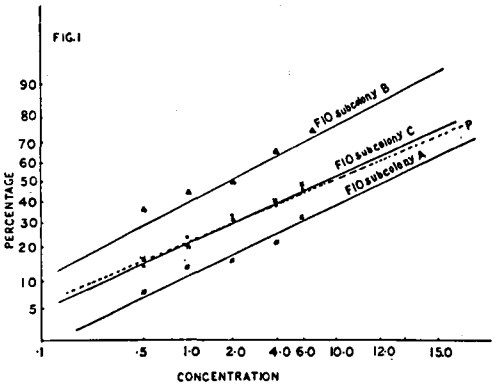

Fig. 1. Loss and reversion of sevin resistance in *Musca domestica nebulo.*

values to sevin whereas the relexation of pressure greatly lowered the degree of resistance as the LC_{50} values for subcolony B decreased from 9.0 to 1.8 representing a fall of 144.0 times. In case of third subcolony C resistance ratio was more or less maintained. However, there were minor fluctuation in the LC_{50} values when the flies reared under alternating conditions of relaxation and pressurization. The resistance ratio obtained in 10th generation when compared to the corresponding ratio of parent generation showed only a decline of 6.0 fold resistance. This shows that the selection in alternate generations of rearing may help to maintain the level of resistance. Since the present sevin selected strain did not reach homozygocity as regards to resistance trait, relexation of pressure resulted in diluting the resistance factor in the population resulting an increase in number of susceptible homozygotes but it restored again in the next generation when the selection pressure was applied by killing most of the susceptible heterozygotes.

As pointed out by Keiding (1963) that the reversal of resistance to DDT, BHC and diazinon in houseflies results in a heterozygous population with only a very highly resistant individuals and if the heterozygotes are sufficiently susceptible, resumption of insecticide pressure may prove advantageous in controlling the pest species though tolerance tends to return quickly. The practical implication of such a knowledge in control programmes may be useful, as early detection of insecticide resistance in field populations and subsequent withdrawl of the insecticide may bring about a rapid reversal of resistance keeping thereby the population at a high level of susceptibility to the insecticides.

Summary

The loss and reversion of resistance was studied in a sevin resistant strain of *M. d. nebulo* which had been previously developed by selection pressure in the laboratory. Flies were divided into three subcolonies. One of them was selected continuously for ten generations, other was reared

Table 1. LC_{50} levels and resistance ratios of generations of the selected strain on successive relaxation and selection with sevin.

Generation	*Subcolony A**		*Subcolony B*		*Subcolony C*	
	LC_{50}	Resistance ratio R/N	LC_{50}	Resistance ratio R/N	LC_{50}	Resistance ratio R/N
P	9.0	180.0	9.0	180.0	9.0	180.0
F_1	—	—	8.8	176.0	8.7	174.0
F_2	—	—	8.1	162.0	9.2	184.0
F_3	—	—	7.4	148.0	8.9	178.0
F_4	—	—	6.2	124.0	9.0	180.0
F_5	9.8	196.0	5.8	116.0	8.2	164.0
F_6	—	—	5.2	104.0	8.8	176.0
F_7	—	—	—	—	8.0	160.0
F_8	11.2	224.0	—	—	9.4	168.0
F_9	11.5	230.0	2.8	56.0	8.3	166.0
F_{10}	12.1	242.0	1.8	36.0	8.7	174.0

* Subcolony A selected with sevin in successive generations of rearing, Subcolony B reared in absence of insecticidal pressure and Subcolony C selected with sevin in alternate generations of rearing.

in absence of insecticide and the last one was selected in alternate generations of rearing. The continuous selection pressure resulted an increase in resistance ratio. However, the level of resistance was greatly lowered when the flies were bred in an environment free of insecticide. The colony which was selected in alternate generations of rearing showed no decline of resistance ratio.

Acknowledgements The author is grateful to Prof. Nawab H. Khan for untiring help and guidance during the progress of the above research work. Thanks are also due to Prof. S. M. Alam, Head of the department for providing necessary facilities.

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Mating Vigour and Sexual Competitiveness of Chemosterilized Males of *Musca domestica nebulo* Fabr. Musharraf A. Ansari (Department of Zoology, Aligarh Muslim University, Aligarh (U. P.), India.) Received August 1. 1972, *Botyu-Kagaku* 37, 125, 1972.

18. イエバエ不妊化雄の交尾時の活性と競争 Musharraf A. Ansari (Aligarh Muslim 大学, 動物学教室) 47. 8. 1. 受理

apholate, tepa, metepa, hempa 及び hemel によって不妊化したイエバエ雄は，交尾活性において，正常雄となんら活性に差はみられなかった．正常雄の数を不妊化雄の2倍入れた交尾試験では，理論値の33.3%に近い値の不妊化率を示した．

Several workers have studied the effects of radiation and chemosterilization on the mating vigour and sexual competitiveness of male insects. Davis *et al.* (1959) observed a significant loss in the mating vigour of males of *Anopheles quadrimaculatus* when they were exposed to gamma irradiation. Similar results were obtained by Dame *et al.* (1964) in chemosterilized males of *Aedes aegypti*. On the other hand no reduction in sexual competitiveness could be found in males of *Culex fatigans* when treated with apholate (Raghuwanshi, 1969). The irradiated and chemosterilized males of *M. d. domestica* were also eqally vigorous to the normal ones (Schmidt *et al.*, 1964). Labrecque *et al.* (1962) reported that male houseflies sterilized with 1.0 percent of apholate were almost equally or even more aggressive than the normal ones. The same author with his associates demonstrated in 1966 that hempa did not impair with the mating competitiveness of males or of the motility of the sperm when fed on 1.0 percent of this chemical. This was later confirmed by Ogata and Tanaka (1967) who observed that hempa treated males of *M. d. vicina* were almost as vigorous as the normal ones. Males of M. *sorbens* when sterilized with metepa were also as competitive as the normal ones in mating with the normal females (Hafez *et al.*, 1970).

The findings reported above suggest that the effects of sterilizing agents on the mating vigour of males are some what specific and vary with the mode of treatment. Since no attempt has been made to study the effects of such chemicals on the mating behaviour of *M. d. nebulo*, an attempt has been made to study this phenomenon by incorporating the candidate chemosterilant in the diet of the adults.